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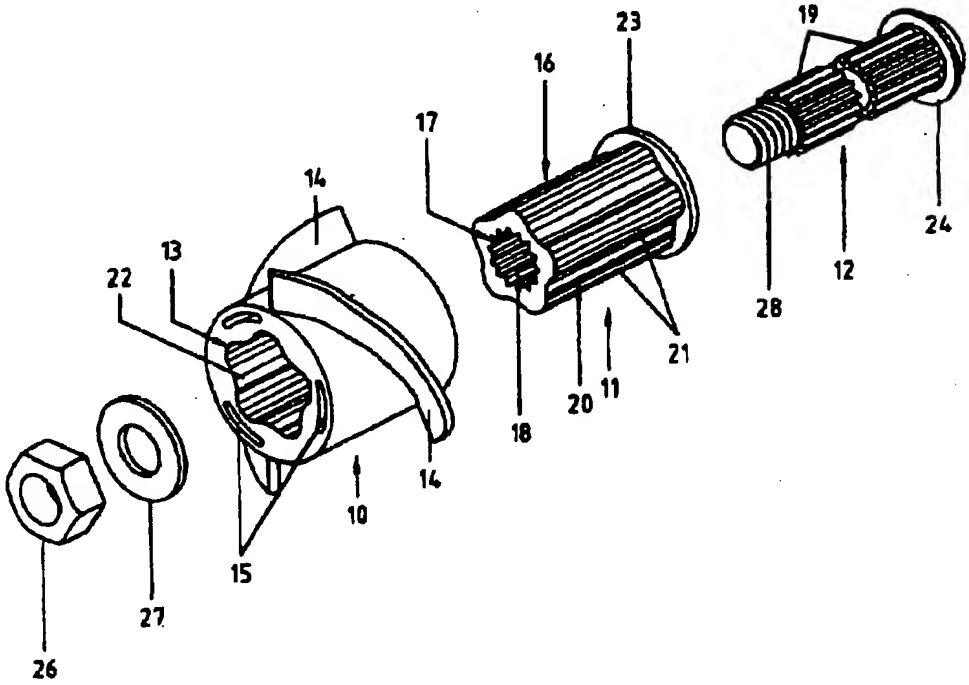

(57) Abstract

A mounting assembly, for mounting a propeller hub (10) to a propeller drive shaft (12), including an adaptor (11) which has an internal bore (17) which is splined for engagement with splines (19) on the shaft (12) and which has an external load surface (16) for engagement within a correspondingly shaped bore (13) of the hub (10) to non-rotatably mount the hub (10) to the shaft (12). The configuration of the spline (18) of the bore (17) may be varied to match the shaft (12) to which the propeller hub (10) is to be mounted.

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FIG. 1

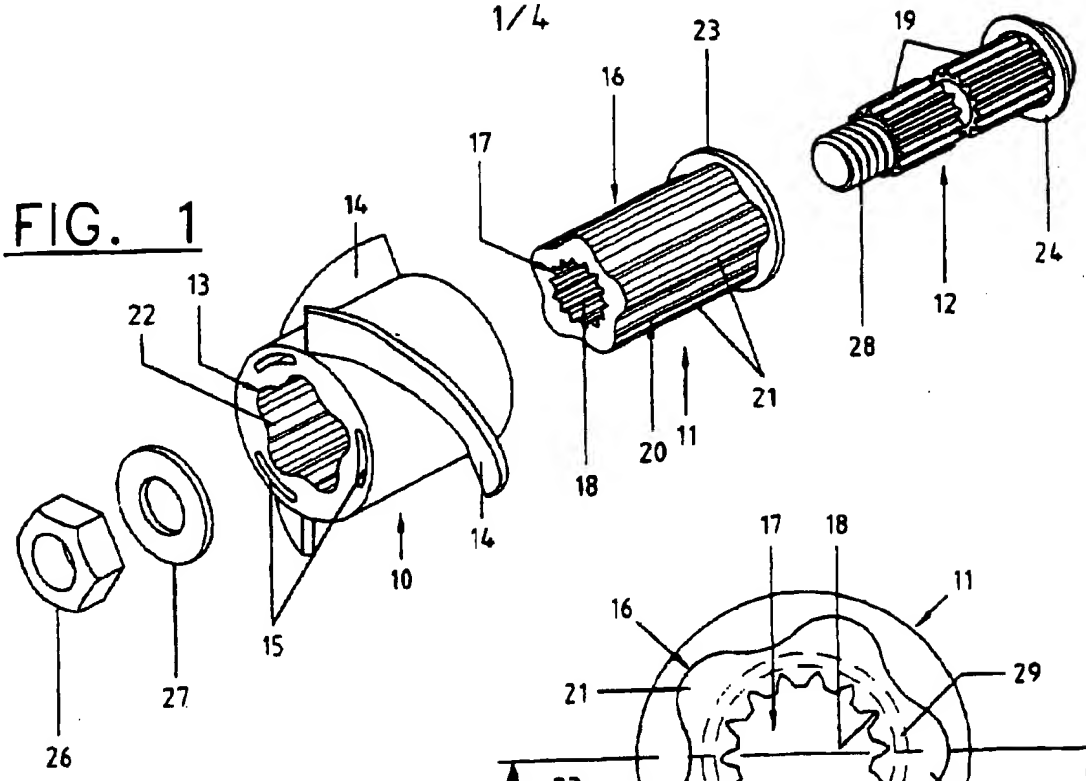

FIG. 2

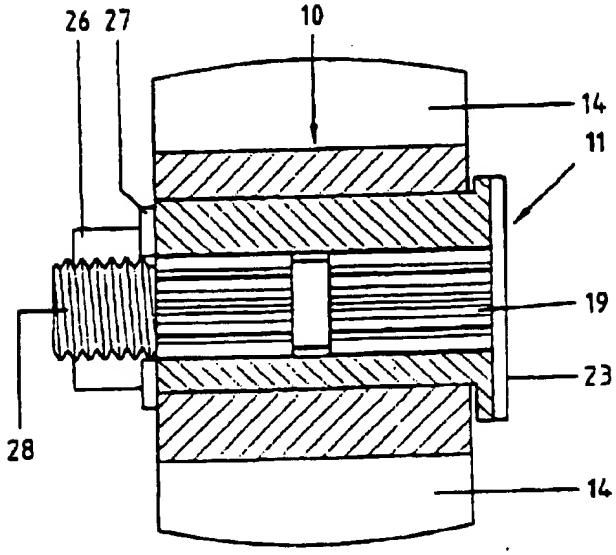

FIG. 4

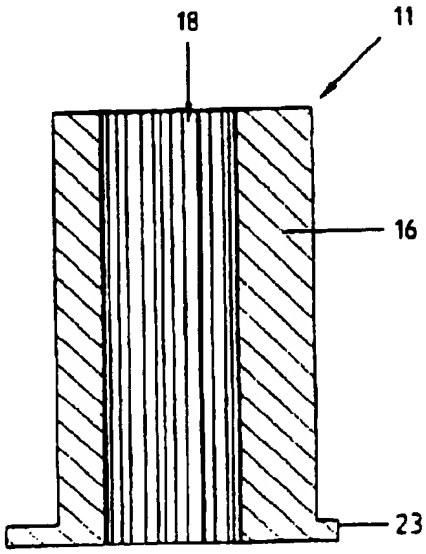

FIG. 3

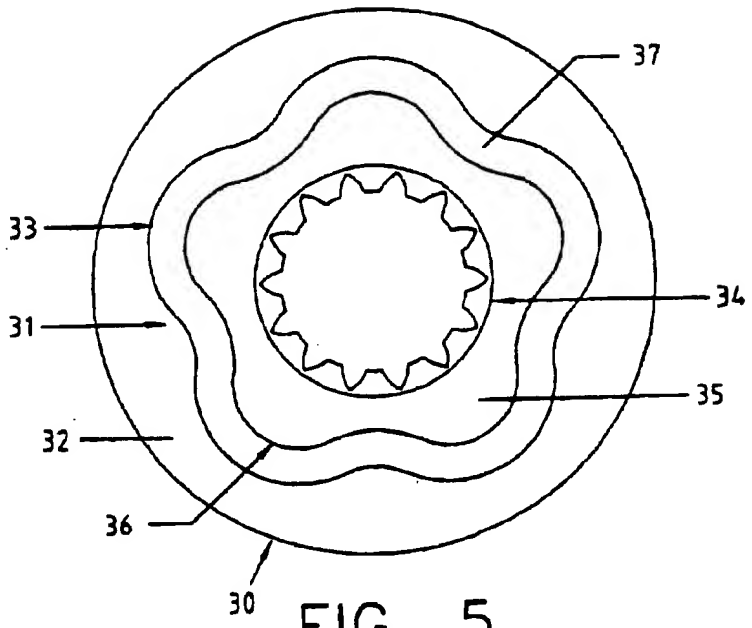

FIG. 5

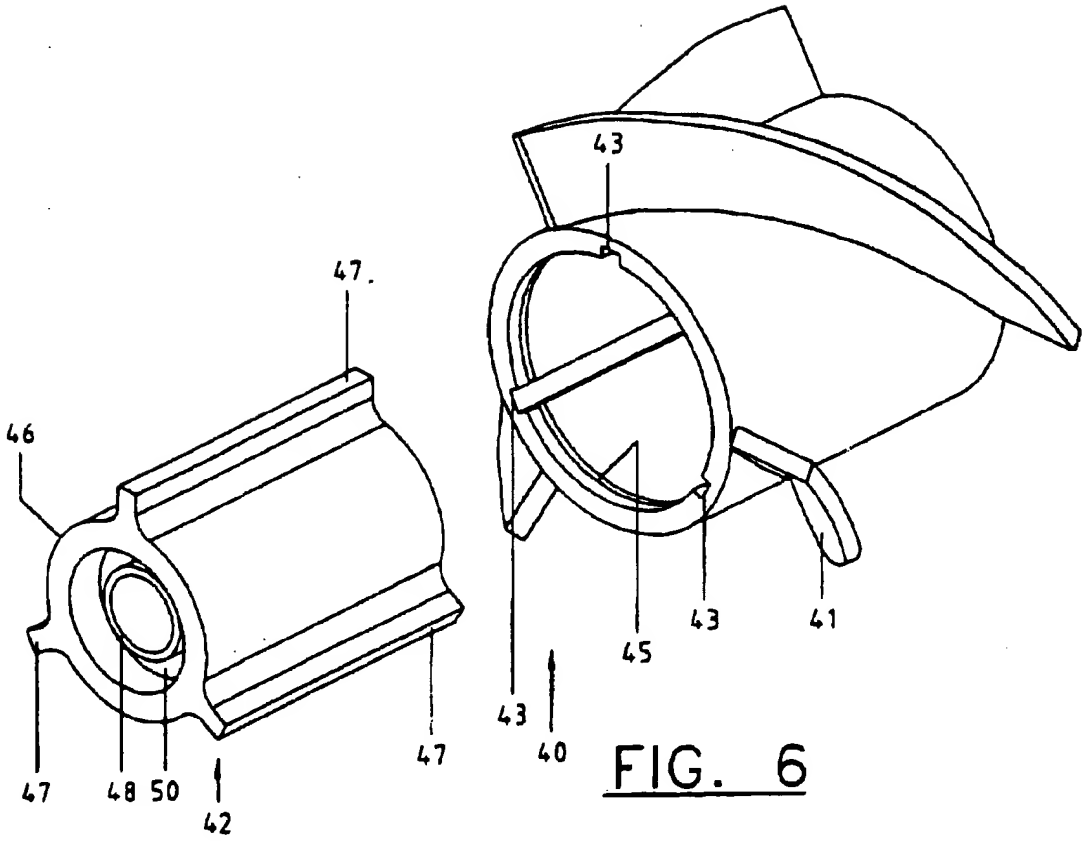

FIG. 6

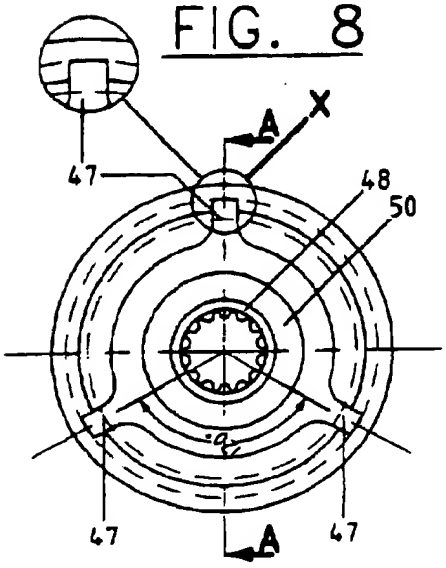

FIG. 7

FIG. 8

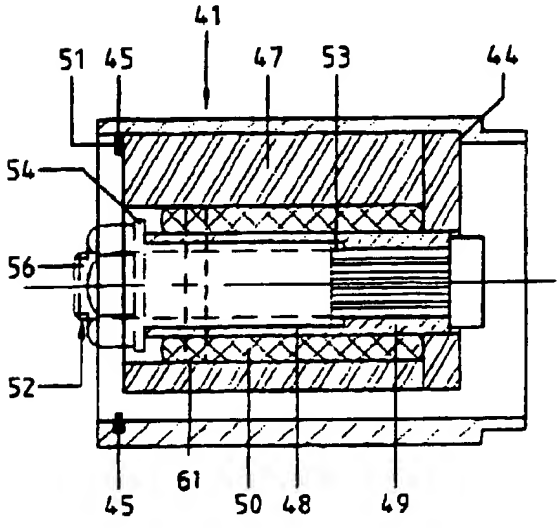

FIG. 9

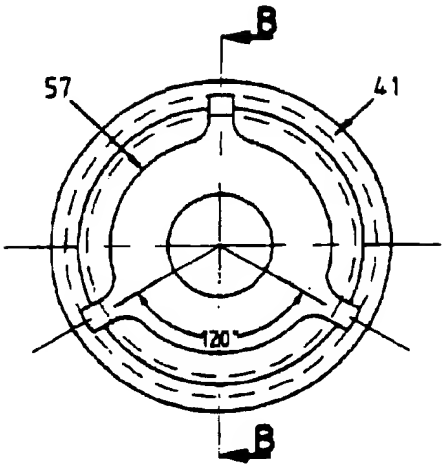

FIG. 10

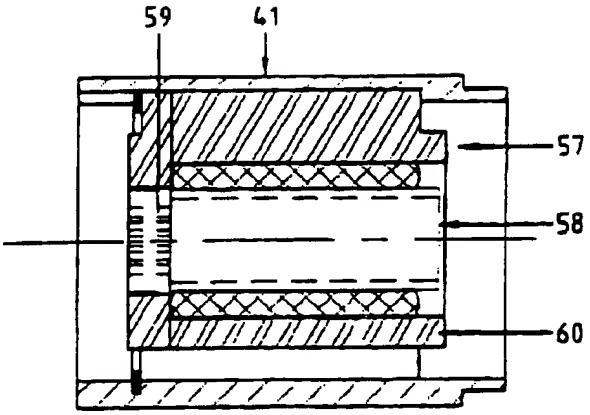

FIG. 11

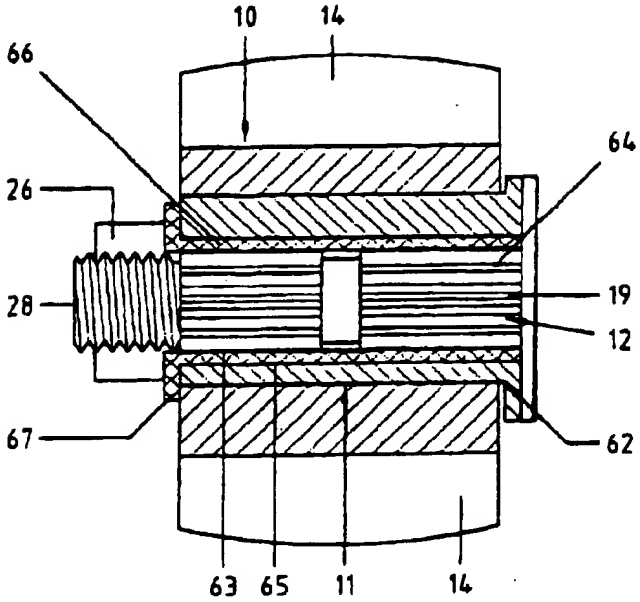

FIG. 12

MOUNTING ASSEMBLY FOR PROPELLERS

Field of the Invention

This invention relates to improvements to marine propellers and in particular to an improved mounting assembly for propellers, particularly but not exclusively designed for outboard motors.

Background Art

Marine propellers generally include a hub portion, a plurality of blades extending from the hub portion and a bush which is located within the hub portion and which has a diameter such as to neatly receive the propeller shaft. The bush often incorporates a splined section to co-operate with a spline on the shaft so that the hub is fixed for rotation with the shaft. Alternatively, a transverse pin may be provided to pass through the shaft and bush to secure the propeller for rotation with the shaft. Generally such propellers are designed for specific engines and cannot be interchanged between engines of different manufacturers, often because the bush and/or spline cannot fit the propeller shaft of those engines.

An object of the present invention is to provide a mounting assembly for a propeller which adapts a propeller for mounting to propeller drive shafts of many different configurations and sizes.

A further object of the present invention is to provide a mounting assembly which may be used with any type of propeller.

Other objects and advantages of the invention will become apparent from the following description.

Summary of the Invention

The present invention thus provides in one aspect a mounting assembly for mounting a propeller to the drive shaft of an engine, said propeller having a hollow hub and said mounting assembly including an adaptor, said adaptor being adapted to be detachably received within said propeller hub so as to be rotatable therewith, and having

means adapted for engagement with said propeller shaft so as to be rotatable therewith.

Preferably the adaptor is axially slidable into the propeller hub and is multi-lobed form in its outer surface for cooperation with the hub. The hub suitably includes a bore with an inner surface of complementary form to the outer surface of the adaptor so as to enable cooperation between the adaptor and hub. The adaptor may include a plurality of circumferentially spaced surface and the hub includes complimentary inner surfaces for co-operation with the surface on the adaptor. Most preferably, the adaptor has five lobes, however it may have any number of lobes. The lobes are preferably of curved form in cross section such as to form in the external surface of the adaptor troughs and crests which are in the general form of a sine curve to enhance transmission of torque between the adaptor and propeller.

The means on the adaptor for engagement with the propeller shaft preferably comprises a longitudinally extending internal spline configuration complementary to the pattern of the external spline on the propeller shaft to which the propeller may be mounted. The spline on the adaptor may be formed integrally with the adaptor or on an insert such as a bush secured or moulded into the adaptor. A harmonic balancer of generally cylindrical or annular form may be located and support co-axially within the adaptor about the bush. Such a harmonic balancer may be formed of elastically compressible material. Alternatively harmonic balancing may be achieved by forming the adaptor of elastically compressible material. In such an arrangement, relatively soft material may be used for the adaptor and the adaptor/hub male/female complementary configuration will prevent slipping between the adaptor and hub.

The adaptor is suitably provided with an end flange for abutment with a stop on, or enlargement or carried by the propeller shaft. This sets the correct axial position of the propeller in relation to different

gear case designs and variations of recess dimension and tolerances of original manufacture propeller designs.

The present invention in a further aspect provides a mounting assembly for mounting a propeller to the shaft of an engine, said propeller having a hollow hub and said mounting assembly including an insert, said insert being adapted to be detachably received within said propeller hub so as to be rotatable therewith, and bush means located coaxially within said insert and adapted to engage said propeller shaft to couple said insert to said shaft. The bush may include external splines for co-operation with complementary splines on the propeller shaft.

Preferably the insert is axially slidable into the propeller hub and retaining means are provided for retaining the insert within the hub. Preferably, the insert includes a plurality of radially extending ribs and the hub includes a plurality of axially extending slots adapted to receive a respective rib to enable the insert to be slidably moved into the hub.

The retaining means for retaining the insert within the hub may include a shoulder at one end of the hub against which the insert may abut and a retaining device at the opposite end of the hub adapted for co-operation with the insert. The retaining device may comprise a circlip which is adapted to be located in an annular groove with the hub at the end thereof opposite the shoulder. The insert is preferably of hollow cylindrical form and the ribs extend radially outwardly therefrom. The insert may be provided with three equally spaced ribs arranged at one hundred and twenty degrees to each other. Alternatively, the insert may have more than three equally spaced ribs.

The bush means preferably comprises a generally cylindrical bush located and support co-axially within the insert. A shock absorbing ring of resilient material, such as rubber, and of hollow cylindrical form may be located within the insert between the inner walls of the insert and the outer wall of the bush to mount the bush co-axially

within the insert and provide for shock absorbing between the bush and insert.

Whilst the insert normally includes an internal spline for engaging the external spline on a propeller drive shaft, where the propeller drive shaft does not include an external spline, the insert has a bore to receive the shaft and a retaining pin or pins are provided to extend radially through the shaft and insert to mount the insert non-rotatably to the shaft.

Brief Description of the Drawings

In order that the invention may be more readily understood and put into practical effect, reference will now be made to the accompanying drawings which illustrate a preferred embodiment of the invention and wherein:-

Fig. 1 is an schematic exploded view showing the mounting arrangement for a propeller according to the present invention;

Fig. 2 is an end view of an adaptor for mounting of a propeller to a propeller shaft;

Fig. 3 is a sectional view along A-A of Fig. 2;

Fig. 4 illustrates in sectional view the assembled hub insert and shaft;

Fig. 5 is an end view of further form of adaptor according to the invention;

Fig. 6 is an exploded view showing a mounting assembly according to a further form of the present invention;

Fig. 7 is an end view of the propeller hub provided with the removable insert;

Fig. 8 is an enlarged view of the region X of Fig. 7;

Fig. 9 is a sectional view along A-A of Fig. 5;

Fig. 10 is an end view of a hub with an alternative insert;

Fig. 11 is a sectional view along line B-B of Fig. 10;

Fig. 12 illustrates a further modified form of mounting assembly according to the invention.

Detailed Description of the Embodiments

Referring to the drawings and firstly to Fig. 1 there is illustrated in exploded view a hub 10 of a propeller and an adaptor 11 which may be located within the hub 10 and defines a mounting assembly for mounting the hub 10 to a propeller shaft 12. The hub 10, in this embodiment is of generally cylindrical form and is provided with a central longitudinally extending bore 13. The hub 10 may carry propeller blades 14 of any configuration and may if desired incorporate exhaust ports 15 of any configuration which extend longitudinally of the hub 10.

The adaptor 11 as more clearly shown in Figs. 2 and 3 includes a hollow elongated body portion 16 having a longitudinally extending bore 17 provided with an internal longitudinally extending spline configuration 18 to match the external spline or splines 19 on the propeller shaft 12 to which the adaptor 11 is to be mounted. The external surface 20 of the adaptor 11 is of multi-lobed form and in the embodiment illustrated includes five equi-spaced lobes 21 which have an arcuate or curved external surface. The bore 13 of the hub 10 is of complementary form on its internal surface 22 and thus is provided with five equi-spaced recesses of curved form in cross section which correspond to the lobes 21.

The adaptor 11 additionally includes an end flange 23 which provides the correct axial position of the propeller hub 10 relative to the shaft 12 as described further below.

Where a propeller having a hub 10 is to be mounted to a propeller shaft 12, an adaptor 11 is selected such that its spline 18 matches and is engagable with the spline 19 on the shaft 12. The adaptor 11 is then slid axially over the shaft 12 until the end flange 23 abuts a stop or enlargement 24 on the shaft 12. The length of the adaptor 11 is such as to leave the threaded end 28 of the shaft 12 projecting beyond the end of the adaptor 11 when the adaptor 11 is located over the shaft 12. The propeller hub 10 may then be engaged with the adaptor 11 by aligning

the bore 13 with the adaptor 11 such that the lobe formations 21 on the adaptor are aligned with the correspondingly shaped recesses in the bore 13. The propeller hub 10 is then slid longitudinally over the adaptor 11 until it abuts the flange 23. The hub 10 and adaptor 11 may then be retained on the shaft 12 by means of a nut 26 and washer 27 engaged with the threaded end 28 of the shaft 12. This position is shown in Fig. 4.

The co-operation between the outer lobed surface 20 of the adaptor 11 and complementary surface 22 of the inner bore 13 of the hub 10 will ensure that the hub 10 will rotate with the adaptor 11 when drive is transmitted thereto from a propeller shaft 12.

If the propeller incorporating the hub 10 is to be used with a different shaft 12, the adaptor 11 may be detached and replaced with a substitute adaptor 11 which matches the shaft to which the propeller is to be mounted.

It will thus be appreciated that a range of adaptors 11 may be provided, each having an internal spline 18 for matching to a splined shaft 12 to which a propeller is to be mounted. A propeller having a hub 10 of a form to receive the adaptor may thus be used with a large range of propeller shafts.

In some applications, the adaptor 11 may incorporate a harmonic balancing sleeve 29 (shown in dotted outline in Fig. 2) which may be formed of a elastically compressible material and the spline 18 formed in a separate insert within the adaptor 11. Alternatively, harmonic balancing may be achieved by forming the whole adaptor 11 (other than the spline 18) of an elastically compressible material. In this configuration, the spline 18 may be incorporated in a sleeve secured to or moulded within the body of the adaptor 11.

The adaptor 11 and or hub 10 may be formed of metal or alternatively of plastics. The external configuration of the hub 10 may be of forms other than cylindrical.

Whilst the adaptor 11 shown has five lobes it may

include any number of lobes. Additionally, whilst the lobes are preferably of a curved cross sectional form, they may be of alternative cross sectional forms.

Furthermore, whilst the adaptor 11 described is particularly suited for use with a splined drive shaft 12, it may also be designed for use with a non-spined shaft in which case the bore 17 has a smooth internal surface with an internal diameter slightly greater than the external diameter of the shaft, such that the shaft may be inserted into the bore 17. In this configuration, a pin (shown in dotted outline in Fig. 4) extends radially of and through aligned bores in the shaft 19 and adaptor 11 to secure the adaptor 11 non rotatably to the shaft 19. One or more such pins may be provided.

Fig. 5 illustrates in end view, a further form of adaptor 30 which may be used in substitution for the adaptor 11. The adaptor 30 as with the adaptor 11 includes a hollow body 31 extending from an end flange 32, the body 31 having a lobed outer surface 33 complementary to the recessed inner surface 22 of the hub bore 13. An annular internally splined bush 34 is located coaxially with the body 31. An elastically compressible member or material 35 is located about the bush 34, the member 35 having a lobed outer surface 36 which matches the lobed surface 33 of the body 31. The outer portion 37 of the body 31 is thus of thin annular serpentine form.

The insert 30 is used in the same manner as described with reference to Figs. 1 to 4 with the member 35, being of elastically compressible material, serving as a harmonic balancer or dampener.

In an alternative configuration, the member 35 may be a solid rigid body being provided with the splined sleeve 34 or an internal bore which has a splined configuration for engagement with the splines on the shaft 19. In this configuration, the outer layer 37 may be of elastically compressible material to provide dampening and harmonic balancing.

In a further alternative configuration, the

adaptor 11 may be reversed from its position of Fig. 1 and inserted through the hub bore 22 from the left hand side of Fig. 1. The adaptor 11 is then engaged with the shaft 12 in a similar manner to that described previously and retained by means of a nut 26 and washer 27.

Referring now to Fig. 6 there is illustrated in exploded view a further embodiment of the invention. As shown, the mounting assembly 40 of this embodiment includes hub 41 of a propeller and an insert 42 which may be located within the hub 41 for mounting the hub 41 to a drive shaft. The hub 41, in this embodiment is of generally cylindrical form and is provided on its inner side face with three longitudinally extending circumferentially spaced grooves 43. As more clearly shown in Fig. 9, the hub 41 includes an internal shoulder 44 at one end against which the insert 42 may abut, whilst an annular groove 45 is provided at the opposite end of the hub 41 to receive a circlip or similar fastener.

The insert 42 includes a hollow tubular body 46 having three longitudinally extending ribs 47 projecting radially outwardly from the outer surface thereof, the ribs 47 being located at one hundred and twenty degrees to each other. The ribs 47 are of generally rectangular form and of a width to be receivable within the respective grooves 43. Located within the insert 11 is a bush 48 which has an internal diameter slightly greater than the diameter of a propeller shaft to which the hub 10 is to be mounted. The bush 48 includes at one end internal splines 49 for co-operation with the external splines on the propeller shaft as shown in Fig. 1. Surrounding the bush 48 is a shock absorbing sleeve 50 of resilient material, preferably a rubber material, the sleeve 50 filling the space between the bush 48 and insert body 46 to provide a shock absorbing effect therebetween. More than one axially spaced sleeves 50 may be provided, if desired.

Where a propeller having a hub 41 is to be mounted to a propeller shaft, an insert 42 is selected, such that its supported bush 48 is engagable with the

shaft. The insert 42 is then inserted axially into the hub 41 with the outer ends of the ribs 47 locating within the grooves 43 which enables the insert 42 to be slid longitudinally into the hub 41. The insert 42 is abutted at one end against the shoulder 44 whilst the circlip 51 is inserted into the groove 45 to retain the insert 11 in position. The insert 42 is thus retained against axial movement within the hub 41. The assembly may be then mounted on a propeller shaft 52 (shown in dotted outline) such that the bush splines 49 co-operate with the external splines 53 on the shaft 52. The insert 42 and supported propeller hub 41 is retained to the shaft 52 by a washer 54 and nut 55 through engagement with a thread 56 on the end of the shaft 52, the washer 54 being urged against the end of the bush 48.

The co-operation between the ribs 47 and the grooves 43 will ensure that the hub 41 will rotate with the insert 42 when drive is transmitted thereto from the propeller shaft 52.

If the propeller incorporating the hub 10 is to be used with a different shaft, the circlip 51 is removed allowing detachment of the insert 42 and its replacement with a substitute insert 57, as for example shown in Figs. 10 and 11. This insert 57 incorporates a bush 58 of a different size and configuration for matching to the different propeller shaft and may be inserted and retained within the hub 41 in the same manner as described previously. In this instance, the bush 58 has a spline 59 at its end opposite to that of Fig. 9 to suit the spline of a further form of propeller shaft which is secured to the insert 51 by a similar nut and washer arrangement described with reference to Fig. 9. Again a elastically compressible or resilient material 60 is provided between the bush 58 and body of the insert 57.

It will thus be appreciated that a range of inserts for example the insets 42 or 57 may be provided, each having a bush 48 or 58 or similar for matching to a shaft to which a propeller is to be mounted. A propeller

having a hub 41 of a form to receive the insert may thus be used with a large range of propeller designs.

In some applications, the insert 11 may not include the shock absorbing sleeve 50 (or 60) in which case the bush 48 (or 58) or similar member for locating over a propeller shaft may be rigidly mounted to the insert.

The insert 52, 57 and or hub 41 may be formed of metal, such as aluminium or alternatively of plastics. The external configuration of the hub 41 may be of forms other than cylindrical and similarly the inside of the hub 41 may be of other configurations provided that it allows for relative axial sliding movement of the insert 42 or 57 thereto.

The mounting arrangements of Figs. 9 and 11 may also be used with a non splined shaft using retaining pins in a similar manner to that shown in Fig. 4. Thus a retaining pin 61 (shown in dotted outline in Fig. 9) may be provided to extend through the shaft 52 and bush 48 which are provided with aligned bores or apertures for this purpose. More than one such pin 61 may be provided.

In a further configuration shown in Fig. 12, a separate spline adaptor 62 may be provided separate from the adaptor 11. The spline adaptor 62 may have a bore 63 therethrough and internal splines 64 for engagement with the splines 19 on the shaft 12, so as to be rotatable with the shaft 12. The external surface 65 of the spline adaptor 62, in this configuration is designed to mate with an internal bore 66 within the main adaptor 11' to non rotatably mount the main adaptor 11 to the spline adaptor 62 and thus to the shaft 12. The mating surfaces 65 and 66 may be similar to the mating arrangement between the adaptor 11 and bore 13 of the hub 10. Alternatively, any other complimentary mating configuration may be employed by which the spline adaptor 62 may be inserted into the adaptor 11' to be non rotatable relative thereto. The spline adaptor 62 may have an end flange 67 and a nut 26 engaged with the thread 28 on the end of the shaft 12 abuts against the flange 67 or through an intervening washer to

retain the assembly to the shaft 12.

Whilst the above has been given by way of illustrative embodiment of the invention, all such modifications and variations thereto as would be apparent to persons skilled in the art are deemed to fall within the broad scope and ambit of the invention as herein defined in the appended claims.

CLAIMS

1. A mounting assembly for mounting a propeller to the drive shaft of an engine, said propeller having a hollow hub and said mounting assembly including an adaptor, said adaptor being adapted to be detachably received within said propeller hub so as to be rotatable therewith, and having means adapted for engagement with said propeller shaft so as to be rotatable therewith.

2. A mounting assembly according to Claim 1 wherein said adaptor is axially slidable into said propeller hub and is multi-lobed form in its outer surface for cooperation with the hub.

3. A mounting assembly according to Claim 2 wherein said hub includes a bore of complementary form to the outer surface of the adaptor so as to enable cooperation between the adaptor and hub.

4. A mounting assembly according to Claim 3 wherein said adaptor has five lobes.

5. A mounting assembly according to Claim 2 wherein said lobes are of curved form in cross section.

6. A mounting assembly according to Claim 1 wherein said means on the adaptor for engagement with the propeller shaft comprises a longitudinally extending internal spline configuration complementary to the pattern of the external spline on the propeller shaft to which the propeller may be mounted.

7. A mounting assembly according to Claim 6 wherein said spline on the adaptor is formed integrally with the adaptor.

8. A mounting assembly according to Claim 6 wherein said spline on the adaptor is formed on an insert such as a

bush secured or moulded into the adaptor.

9. A mounting assembly according to Claim 1 and including a harmonic balancer of generally cylindrical form located and support co-axially within the adaptor about the bush.

10. A mounting assembly according to Claim 9 wherein said harmonic balancer is formed of elastically compressible material.

11. A mounting assembly according to Claim 1 wherein said adaptor is formed elastic, compressible material to define a harmonic balancer.

12. A mounting assembly according to Claim 1 wherein said adaptor is provided with an end flange for abutment with a stop on or carried by said propeller shaft.

13. A mounting assembly for mounting a propeller to the shaft of an engine, said propeller having a hollow hub and said mounting assembly including an insert, said insert being adapted to be detachably received within said propeller hub so as to be rotatable therewith, and bush means located coaxially within said insert and adapted to receive said propeller shaft.

14. A mounting assembly according to Claim 13 wherein said insert is axially slidable into the propeller hub and including retaining means for retaining the insert within the hub.

15. A mounting assembly according to Claim 14 wherein said insert includes a plurality of radially extending ribs and the hub includes a plurality of axially extending slots adapted to receive a respective rib to enable the insert to be slidably moved into the hub.

16. A mounting assembly according to Claim 15 wherein said retaining means for retaining the insert within the hub includes a shoulder at one end of the hub against which the insert may abut and a retaining device at the opposite end of the hub adapted for co-operation with the insert.

17. A mounting assembly according to Claim 16 wherein said retaining device comprises a circlip which is adapted to be located in an annular groove within the hub at the end thereof opposite the shoulder.

18. A mounting assembly according to Claim 14 wherein said insert is of hollow cylindrical form and the ribs extend radially outwardly therefrom.

19. A mounting assembly according to Claim 18 wherein said insert is provided with at least three equally spaced ribs.

20. A mounting assembly according to Claim 1 wherein said bush means comprises a generally cylindrical bush located and support co-axially within the insert.

21. A mounting assembly according to Claim 20 and including a shock absorbing sleeve of resilient material, of hollow cylindrical form located within said insert between the inner walls of the insert and the outer wall of the bush to mount the bush co-axially within the insert.

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 95/00513

A. CLASSIFICATION OF SUBJECT MATTER

Int Cl[6]: B63H 23/34, 1/20

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC : B63H 23/34, 1/20

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
AU : IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
DERWENT

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4566855 A (COSTABILE et al) 28 January 1986 Abstract and Figures 1, 2, 9-11	1-21
X	US 5201679 A (VELTE et al) 13 April 1993 Abstract and Drawings	1-21
X	US 4842483 A (GEARY) 27 June 1989 Abstract and Figure 3	1-21

[X] Further documents are listed in the continuation of Box C

[X] See patent family annex

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Date of the actual completion of the international search
3 January 1996

Date of mailing of the international search report
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INTERNATIONAL SEARCH REPORT

International Application No.
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C (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3477794 A (ABBOTT et al) 11 November 1969 whole document	1-21
X	US 4642057 A (FRAZZELL et al) 10 February 1987 Abstract and Drawings	1-21
X	GB 1452568 A (AB VOLVO PENTA) 13 October 1976 whole document	1-21

INTERNATIONAL SEARCH REPORT

International Application No.
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This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
US	4566855	US	4417852				
US	5201679						
US	4842483	EP	254106	JP	63074797	CA	1312505
US	3477794						
US	4642057	CA	1217390	DE	3436600	GB	2151713
		JP	60234098	SE	8406413		
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		FI	3539/74	FR	2254476	IT	1024427
		JP	50090088	SE	7316755		

END OF ANNEX